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PROJECT SPECIFIC PLAN FOR AREA 8, PHASE II AND AREA 6 TRIANGLE AREA CERTIFICATION SAMPLING AND DRAINAGE DITCH INVESTIGATION

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
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1

1954

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2

1954

TABLE OF CONTENTS

1.0 Introduction 1-1
1.1 Purpose 1-1
1.2 Scope 1-2
1.3 Key Personnel 1-2

2.0 Field Program 2-1
2.1 Certification Design 2-1
2.2 Surveying 2-1
2.3 HPGe Gamma Measurements 2-2
2.3.1 HPGe Measurement Identification 2-2
2.3.2 Surface Soil Moisture Gauge Measurements 2-3
2.3.3 Background Radon Monitoring 2-3
2.4 Physical Sample Collection 2-4
2.4.1 Equipment Decontamination 2-5
2.4.2 Physical Sample Identification 2-6
2.4.2.1 Certification Sample Identification 2-6
2.4.2.2 Drainage Ditch Investigation Sample Identification 2-6

3.0 Sample Analysis 3-1

4.0 Quality Assurance/Quality Control Requirements 4-1
4.1 Field Quality Control Samples, Analytical Requirements and Data Validation 4-1
4.2 Procedures and Manuals 4-1
4.3 Independent Assessment 4-2
4.4 Implementation of Changes 4-2

5.0 Health And Safety 5-1

6.0 Disposition of Wastes 6-1

7.0 Data Management 7-1

Appendix A Data Quality Objectives (SL-043, Rev. 1 and SL-048, Rev. 4)
Appendix B Area 8, Phase II and Area 6 Triangle Area Certification Samples and Drainage Ditch Investigation Samples

1954

LIST OF TABLES

Table 1-1 Key Personnel
Table 3-1 Sampling and Analytical Requirements
Table 3-2 Target Analyte List for All Samples Collected under this PSP

LIST OF FIGURES

Figure 1-1 Area 8, Phase II and Area 6 Triangle Area Location Map
Figure 2-1 Area 8, Phase II and Triangle Area Sub-CUs, Certification Sampling Locations and Drainage Ditch Investigation Sampling Locations

4

LIST OF ACRONYMS AND ABBREVIATIONS

1954

A8PII	Area 8, Phase II
ASL	analytical support level
AWWT	Advanced Wastewater Treatment (Facility)
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CU	certification unit
D&D	decontamination and dismantlement
DQO	Data Quality Objective
EPA	U.S. Environmental Protection Agency
FACTS	Fernald Analytical Customer Tracking System
FAL	Field Activity Log
FEMP	Fernald Environmental Management Project
FDF	Fluor Daniel Fernald
FRL	final remediation level
GIS	Graphical Information System
HPGe	high purity germanium detector
LAN	Local Area Network
MS	Microsoft
OEPA	Ohio Environmental Protection Agency
PSP	project specific plan
PWID	Project Waste Identification Document
QA/QC	Quality Assurance/Quality Control
RWP	Radiation Worker Permit
SCEP	Soil Characterization and Excavation Project
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SED	Sitewide Environmental Database
SEP	Sitewide Excavation Plan
SPL	Sample Processing Laboratory
TAL	Target Analyte List
V/FCN	Variance/Field Change Notice
WAO	Waste Acceptance Organization

1.0 INTRODUCTION

1954

1.1 PURPOSE

Area 8, Phase II (A8PII) is the 18.56-acre area on the northwest corner of the Fernald Environmental Management Project (FEMP), west of Paddys Run and north of the railroad tracks. The Area 6 "Triangle Area" is the 6.90-acre area located west of Paddys Run Road and containing the railroad tracks leading to and from the site. The southern portion of this property will be certified under the scope of this Project Specific Plan (PSP). Figure 1-1 shows the location of A8PII and the Area 6 Triangle Area (A6TA) in proximity to the rest of the FEMP site.

The perimeter location of A8PII makes it an ideal location for one of the initial FEMP natural resource restoration projects; therefore, it has been selected as the location for the Demonstration Forest Project. The conceptual design of this project is underway, and implementation is scheduled to begin in the spring of 2000, thus making A8PII a priority for certification in 1999. In order to use the drainage running onto A8PII from the A6TA, the southern portion of this area will also be certified along with A8PII. Because shipments of Waste Pit material will be crossing rail line in the northern portion of the A6TA (the railroad corridor), this soil will not be certified until after completion of Waste Pit remediation and removal of the railroad line.

To investigate if drainage from the railroad corridor could later impact the Demonstration Forest Project due to site related contamination, four samples will be collected from the base of the drainage ditch that runs through the railroad corridor. The first of these four samples is located upstream from where runoff from the railroad track corridor could enter this ditch. The second and third samples surround the point where a culvert beneath the railroad empties drainage from the southern portion of the A6TA into this ditch. The fourth sample is located at the eastern edge of the A6TA just before the drainage enters a culvert beneath Paddy's Run Road. These samples will be analyzed and validated in the same manner as the A8PII and A6TA certification samples, as discussed in this PSP; however, they will not be considered "certification samples", nor will they be subjected to certification statistical analysis. These results will be reported in the Certification Report for A8PII and the A6TA.

1954

1.2 SCOPE

This PSP covers all real-time scanning and physical sampling activities associated with the certification of A8PII and the southern portion of the A6TA. The certification design is consistent with the Certification Design Letter for these areas. The PSP also covers the sampling activities associated with the A6TA drainage ditch investigation. Certification sampling and analysis will be consistent with Data Quality Objective (DQO) SL-043, Rev. 1 (see Appendix A), while the drainage ditch investigation sampling program will be consistent with DQO SL-048, Rev. 4. All sampling and analysis activities conducted under this PSP will be consistent with the Sitewide Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Quality Assurance Project Plan (SCQ), and the Sitewide Excavation Plan (SEP).

1.3 KEY PERSONNEL

Key Soil Characterization and Excavation Project (SCEP), Environmental Monitoring, Sample and Data Management, and Waste Acceptance Organization (WAO) personnel responsible for performance of the project are listed in Table 1-1.

TABLE 1-1
KEY PERSONNEL

TITLE	PRIMARY	ALTERNATE
DOE Contact	Kathi Nickel	Rob Janke
Area 8 Project Manager	Eric Woods	Eric Kroger
Area 8 Characterization Lead	Eric Kroger	John Homer
Real-time Measurement Lead	Joan White	Dave Allen
Field Sampling Lead	Mike Frank	Tom Buhrlage
Surveying Lead	Jim Schwing	Jim Capannari
Waste Acceptance Operations	Linda Barlow	Greg Ancona
Laboratory Contact	Bill Westerman	Keith Tomlinson
Data Validation Contact	Jim Chambers	Jim Cross
Data Management Contact	Susan Marsh	Jeff Maple
Quality Assurance Contact	Reinhard Friske	Harold Swiger
Health and Safety Contact	Debra Grant	Lewis Wiedeman

7

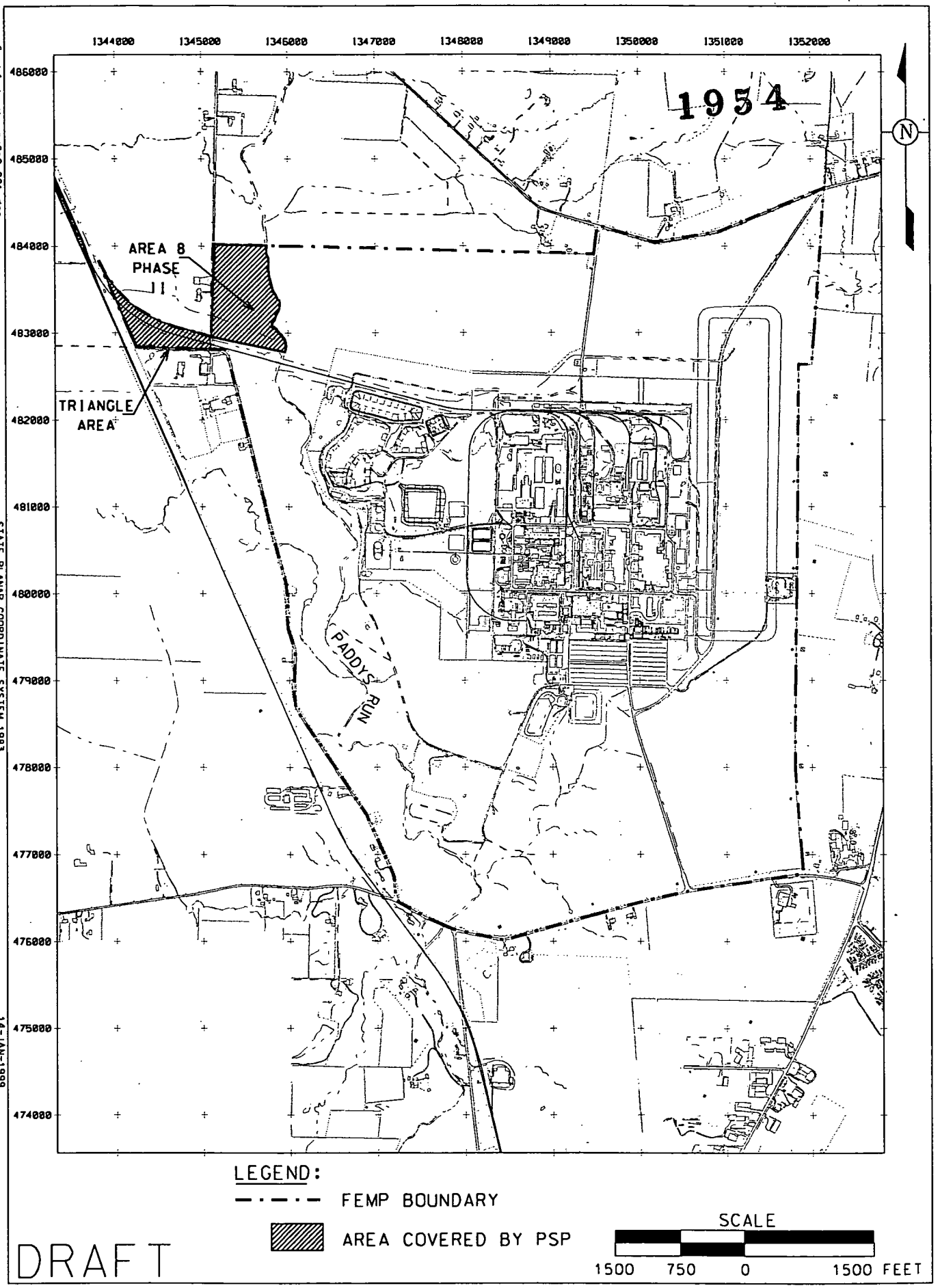

FIGURE 1-1. AREA 8, PHASE II AND TRIANGLE AREA LOCATION MAP

2.0 FIELD PROGRAM

1954

The field program includes certification sampling and associated real-time scanning for A8PII and the southern portion of the A6TA. It also includes the collection of four drainage ditch investigation samples from the A6TA.

2.1 CERTIFICATION DESIGN

Details and logic of the certification design for A8PII and the A6TA are described in the Certification Design Letter. The certification design and sampling strategy are consistent with Section 3.4 of the SEP. Four Group 2 certification units (CUs) have been established within A8PII, and one Group 2 CU has been established within the southern portion of the A6TA. Certification sampling will consist of the collection of 16 randomly selected physical samples plus one duplicate within each CU. Sample locations were generated by dividing each CU into 16 approximately equal sub-CUs, then randomly selecting an easting and northing coordinate within the boundaries of each. The selected locations have been verified to meet the minimum distance criterion, as discussed in Section 3.4.2.1 of the SEP. They also have been field verified to assure that surface obstacles will not prevent sample collection. The northern portion of the A6TA (the railroad corridor) will not be certified under the scope of this certification effort.

Of the 16 certification samples to be collected per CU, 12 will be submitted for analysis. In order to determine which samples to analyze while still providing sufficient areal coverage, each CU was divided into quadrants with each quadrant containing four sample locations. Three of the four samples from each quadrant were then randomly selected for analysis, resulting in a total of 12 samples analyzed per CU. The other four samples from each CU are to be archived and analyzed only if necessary. All certification samples, duplicate samples and the samples to be archived are identified in Appendix B, along with the four drainage ditch investigation samples.

2.2 SURVEYING

The NAD83 State Planar coordinates for each sample location (as shown in Appendix B), have been determined and field verified. Figure 2-1 shows the planned certification and drainage ditch investigation sampling locations. Because of the presence of the cows in A8PII, these certification

locations and CU boundaries will not be marked in the field until after March 1, 1999 when the grazing lease expires.

1954

2.3 HPGe GAMMA MEASUREMENTS

Per requirements of the SEP and DQO SL-043, Rev. 1, prior to physical sample collection high purity germanium detector (HPGe) measurements will be obtained at each certification sampling location (but not at the four drainage ditch investigation locations) to support studies on their comparability with analytical results. The HPGe readings are collected only for the purpose of evaluating their comparability with analytical results, and will not be used to make certification decisions, nor will they be reported in the Certification Report for A8PII and the A6TA. HPGe detector operations will be performed in accordance with procedure EQT-23, Operation of High Purity Germanium Detectors. Moisture/density measurements will be performed in accordance with procedure EQT-32, Troxler 3440 Series Surface Moisture/Density Gauge - Calibration, Operation, and Maintenance; or EQT-39, Operation of the Zeltex Infrared Moisture Meter. System calibration activities for HPGe detectors will be performed in accordance with procedure EQT-22, High Purity Germanium Detector In-Situ Efficiency Calibration.

One HPGe reading will be obtained at each certification sampling location. The HPGe detector system acquisition time will be set to 900 seconds (15 minutes). The detector height will be set at 31 centimeters (1 foot) above ground surface. Target analytes of all HPGe readings will be total uranium, radium-226 and thorium-232. One duplicate HPGe reading will be obtained per CU at the same location where the duplicate physical sample will be collected (see Appendix B) using the same detector height (1 foot) and acquisition time (15 minutes). The duplicate will be collected immediately following the original measurement and at the same location as the original measurement.

2.3.1 HPGe Measurement Identification

The HPGe measurement numbering format will be assigned a unique sample identification number according to the scheme,

A8P2-CU-C-Location G-QC, where:

A8P2 = Sample collected from Remediation Area 8, Phase II (Note that the number "2" is used in place of the roman numeral "2" in the ID number for data management purposes.)

CU	=	Certification unit from which sample was collected (e.g., 01, 02, 03 or 04)
C	=	Certification Sample
Location G	=	Sample Location number within each CU (1 through 16), immediately followed by the letter "G" to indicate a Gamma reading
QC	=	Quality control sample, if applicable. A "D" indicates a duplicate sample.

For example: *A8P2-02-C-10G-D* is the duplicate gamma reading taken at the tenth certification sampling location within CU-02.

2.3.2 Surface Soil Moisture Gauge Measurements

The Troxler® Moisture/Density Gauge or the Zeltex® Infrared Moisture Meter will be used to obtain soil moisture content measurements according to procedures EQT-32 and EQT-39, respectively. These measurements will be used to correct the real-time data so the readings are representative of environmental conditions. A surface moisture measurement will be obtained at the location of each HPGe reading. All surface moisture gauge measurements will be conducted within eight hours of collecting the real-time measurements if environmental conditions are not expected to change. Technicians cannot collect Troxler® measurements simultaneously with HPGe measurements because internal radioactive sources contained in the Troxler® moisture gauge can cause interference with these measurements; however, the Zeltex® Infrared Moisture Meter can be used along side these detectors. If surface soil conditions are unsuitable for moisture measurements, a soil core will be collected to a depth of 4 inches at each location where the moisture measurement would have been collected. This core will then be submitted to the on-site laboratory for moisture analysis.

2.3.3 Background Radon Monitoring

A background radon monitor (i.e., an HPGe unit) will be utilized during the collection of HPGe measurements to establish background radon information. The monitor will be placed in one location for the day where it will be set at the same height as the HPGe (31 cm). The background radon data will be used per Section 5.3 of the Real-Time User's Manual to correct the Radium-226 data. Radon measurements will be identified as follows: *Area* (A8P2 [where a numerical 2 is used in place of the roman numeral II for data management purposes] or A6TA) - *C* (for certification) - *radon* (purpose of reading) - *height* ("1" = 15 cm, "2" = 31 cm, "3" = 1 m) - *sequential reading number*. For example, the third sequential radon measurement obtained in A8PII at the 31cm detector height would be numbered as: A8P2-C-RADON-2-3.

11

2.4 PHYSICAL SAMPLE COLLECTION

All certification samples will be collected using a 3-inch diameter plastic or stainless steel liner, as identified in procedure SMPL-01, Solids Sampling, and will be sealed using plastic end caps. At the discretion of the Field Sampling Manager, samples may be collected using other methods as specified in SMPL-01. Prior to collection of the soil cores, the field sampling technician will remove all surface vegetation within a 3-inch radius of the points to be sampled using a gloved hand or stainless steel trowel, and taking care not to remove any of the surface soil. Regardless of the sample collection apparatus, the soil samples will be collected from the 0 to 6-inch (surface) interval at each location, and full recovery of the soil at this interval is required. To meet the minimum 1 per 20 requirement for duplicate samples, twice the sample volume will be collected at the following randomly selected sample locations: A8P2-01-1, A8PII-02-15, A8P2-03-10, A8P2-04-12, and A6TA-01-6. These duplicate soil samples will be collected according to procedure SMPL-21, Section 6.6. Note that this section refers to this as a split sample, but it will serve the purposes of a duplicate per SEP requirements. All samples, including duplicates, will be assigned a unique sample identification number as identified in Appendix B.

The A6TA drainage ditch investigation samples will also be collected to a depth of six inches by a method specified in SMPL-01. The sample should include all sediment and soil present to a depth of six inches at the flagged location, and sufficient quantity of material should be collected in order to conduct the prescribed analysis. This change should be noted on the Field Activity Log. No duplicate sample will be collected from the drainage ditch since the 1 per 20 requirement is met by collecting one duplicate certification sample per CU. These four investigation samples are listed at the end of Appendix B and shown of Figure 2-1.

If subsurface obstacles (e.g., tree roots or buried rocks) prevent sample collection at any of the original certification sampling locations, the sample may be collected up to 3 feet in radius from the original location, as long as a CU or sub-CU boundary is not crossed. A move of three feet would not cause a violation of the minimum distance requirement for any of the original sample locations. Samples located near CU or sub-CU boundaries should be moved in a direction away from the boundary, and the distance and direction moved will be noted on the field activity log. If the new location is greater than 3 feet away from the originally planned sample point, it must be checked against the minimum distance requirement, and approval must be obtained from the U.S. Environmental Protection Agency

(EPA) and Ohio EPA (OEPA) prior to collection. This change will be documented on a Variance/Field Change Notice (V/FCN) form. If subsurface obstacles prevent the collection of the drainage ditch investigation sample at the specified location, it can be moved up to 3 feet from the original location, but the samples must still be collected from the base of the drainage ditch. Customer sample numbers and Fernald Analytical Customer Tracking System (FACTS) identification numbers will be assigned to all samples collected. The sample labels will be completed with sample collection information, and technicians will complete a Field Activity Log (FAL), Sample Collection Log, and Chain of Custody/Request for Analysis, which are to be completed in the field prior to being submitted to the Sample Processing Laboratory (SPL).

All analytical samples collected from one CU, including Quality Control samples, will be batched and submitted to the SPL under one set of Chain of Custody forms having the same reference document number. All samples originating from a single CU will represent one analytical release. The four drainage investigation samples will be batched with the samples from CU A6TA-01 as one release. Archive samples (see Appendix B) will be kept under the Chain of Custody of the field crew, and will not be submitted to the SPL. Upon completion of sample collection, the boreholes will be collapsed, with no additional abandonment necessary and no Borehole Abandonment Log required. Also, based on historical data and process knowledge, no photoionization detector survey or radiological survey will be necessary.

2.4.1 Equipment Decontamination

Decontamination is performed to protect worker health and safety, and to prevent the introduction of contaminants from sampling equipment to subsequent soil samples. Field Technicians will ensure that sampling equipment has been decontaminated prior to transport to the field sampling site. The core liners will be decontaminated using the Level II (SMPL-01, Solids Sampling) procedure upon receipt from the manufacturer. Decontamination is also necessary in the field when sampling equipment is reused. If an alternate sampling method is used, equipment will be decontaminated between collection of sample intervals, and again after the sampling performed under this PSP is completed. Equipment that comes into contact with the sample will be decontaminated at Level II (Section K.11, SCQ) in the field, or at the decontamination and dismantlement (D&D) facility. Clean disposable wipes may be used to replace air drying of the equipment.

2.4.2 Physical Sample Identification

2.4.2.1 Certification Sample Identification

Each physical certification sample will be assigned a unique sample identification according to the scheme,

A8P2-C-CU-Location Suite-QC, where:

A8P2	=	Sample collected from Remediation Area 8, Phase II (Note that the number "2" is used in place of the roman numeral "II" in the ID number for data management purposes.)
C	=	Certification Sample
CU	=	certification unit from which sample was collected (e.g., 01, 02, 03 or 04)
Location	=	Sample Location number within each CU (1 through 16)
Suite	=	"R", since all samples will be analyzed for radiological only, with no dash between the *Location* and *Suite*
QC	=	Quality control sample, if applicable. A "D" indicates a duplicate sample. An "X" indicates a rinsate sample.

Therefore, a duplicate sample taken from the 15th sample location from within CU-02 would be identified as A8P2-C-02-15R-D. Rinsates will be identified by the nearest collected sample location. For example, if Location 1 of CU-01 is the first sample collected, the first rinsate would be identified as A8P2-C-01-1R-X.

2.4.2.2 Drainage Ditch Investigation Sample Identification

The four A6TA drainage investigation samples will be identified as *A6TA-INV-x*, where *A6TA* represents the area where the samples were collected, *INV* indicates that these are investigation samples, and *x* is a sequential number (1 through 4) to identify the location, as shown on Figure 2-1. Therefore, the fourth drainage investigation sample would be identified as A6TA-INV-4.

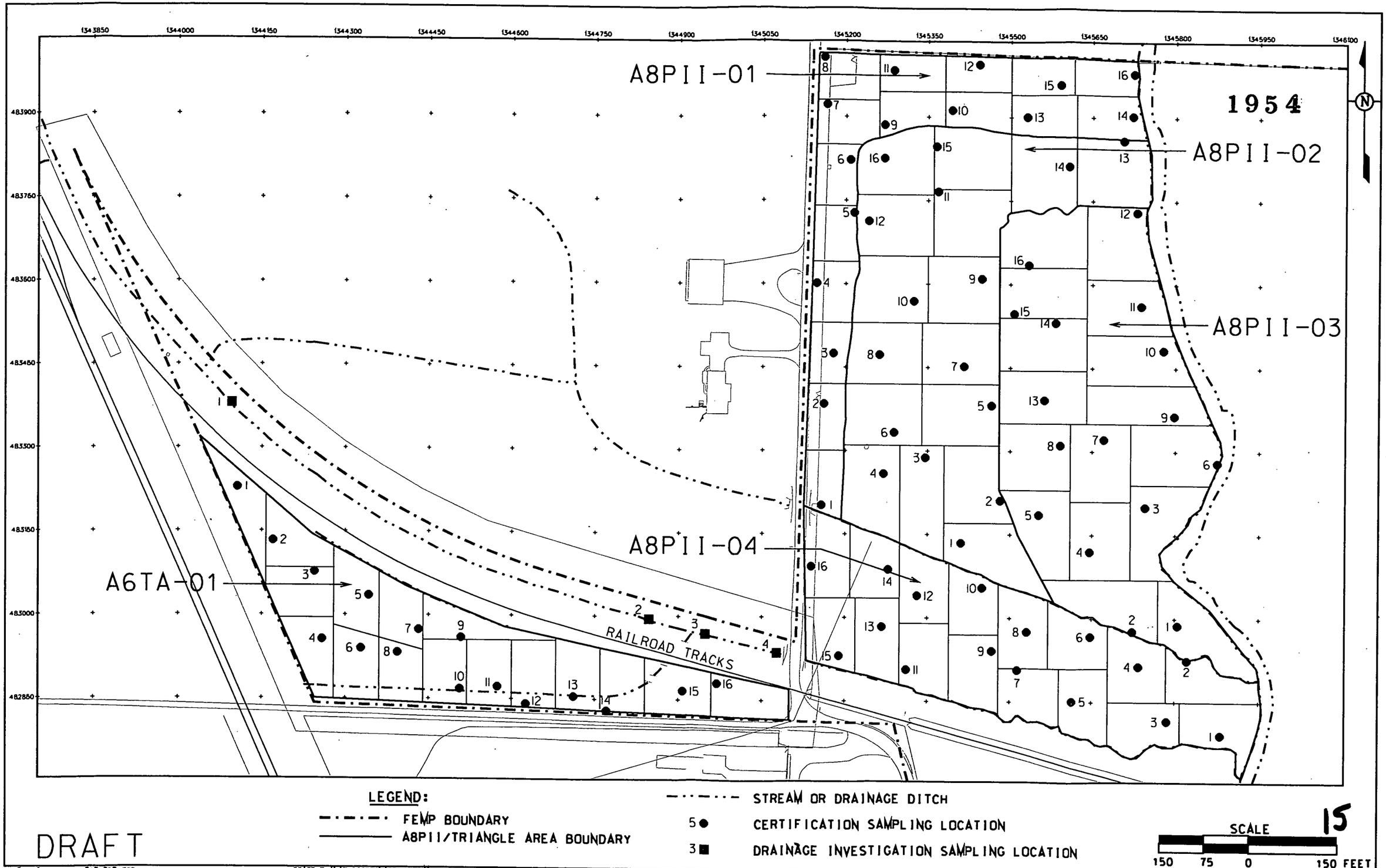

FIGURE 2-1. A8PII AND TRIANGLE AREA SUB-CUs, CERTIFICATION SAMPLING LOCATIONS AND DRAINAGE DITCH INVESTIGATION SAMPLING LOCATIONS

3.0 SAMPLE ANALYSIS

1954

Both the certification samples and the A6TA drainage ditch investigation samples collected under this PSP will be analyzed in the same manner which will meet the requirements of both applicable DQOs. Analyses will be conducted at the on-site laboratory. The necessary volume of all samples collected will be prepared for the appropriate SEP approved analytical method per requirements of the SCQ. Sampling and analytical requirements are listed in Table 3-1. The Target Analyte List (TAL) is shown as Table 3-2.

TABLE 3-1
SAMPLING AND ANALYTICAL REQUIREMENTS

ANALYTE/ TAL	METHOD	SAMPLE MATRIX	LAB	ASL	PRESERVATIVE	HOLD TIME	CONTAINER
Total Uranium, Radium-226, Radium-228, Thorium-228, Thorium-232/ TAL A	SEP Approved	Solid	On-site	E [a]	None	6 months	Plastic or Stainless Steel Core Liner or 500 ml Glass or Plastic
All the above/ TAL A	SEP Approved	Liquid (Rinsate)	On-site	E [a]	HNO_3 to pH<2; Cool to 4°C	6 months	4 liter polyethylene

[a] All analytical requirements will meet analytical support level (ASL) D, but minimum detection levels must be at least 10 percent of the final remediation levels (FRLs).

TABLE 3-2
TARGET ANALYTE LIST FOR ALL SAMPLES COLLECTED UNDER THIS PSP
Project Number 21100-002
TAL 21100-002-A

SEP Approved Analytical Method		
1	ASL E*	Total Uranium
2	ASL E*	Radium-226
3	ASL E*	Radium-228
4	ASL E*	Thorium-228
5	ASL E*	Thorium-232

*Physical sample analytical requirements will be classified as ASL E, but will have the same requirements as ASL D with the minimum detection levels set at least 10 percent of the FRL. HPGe measurements are user defined (ASL E).

4.0 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS 1954

4.1 FIELD QUALITY CONTROL SAMPLES, ANALYTICAL REQUIREMENTS AND DATA VALIDATION

Quality Control, analytical requirements, and data validation requirements for all samples collected will meet the requirements identified in the SEP and the applicable DQOs. For simplicity, the more stringent requirements for certification samples outlined in DQO SL-043, Rev. 1, will also be met for the four drainage ditch investigation samples. Per requirements of the SEP and DQO SL-043, Rev. 1, the field quality control, analytical and data validation requirements for all samples are as are as follows:

- Field Quality Control requirements include one duplicate per CU to meet the 1 per 20 minimum requirement. An additional duplicate does not need to be collected for the four investigation samples since the 1 per 20 requirement is still met. Five rinsates will be collected from the core liners, one for each batch of samples (i.e., one rinsate per CU). If an alternate method of sample collection is used, one rinsate will be collected at a minimum frequency of 1 per 20 pieces of equipment re-used in the field. All field QC samples will be analyzed for TAL A.

- All laboratory analyses will be performed at ASL E, where are requirements meet ASL D but the minimum detection level is set at 10 percent of the FRLs. HPGe readings will be user defined (ASL E), and all QC requirements will be met as specified in the User's Manual.

- All field data will be validated. All laboratory results will be validated to ASL B, and a minimum 10 percent of the results will be validated to ASL D. Since each CU represents one analytical release, an ASL D package will be provided for each sample from one CU. To expedite this process, this will the first CU to have all results returned from the on-site laboratory. If any result is rejected during validation, all data will then be validated to ASL D to determine the integrity of the results. This change will be documented in a variance to this PSP.

Once all data are validated as required, results will be entered into the Sitewide Environmental Database (SED). At that time, the statistical analyses can be performed on the certification samples.

4.2 PROCEDURES AND MANUALS

To ensure consistency and data integrity, field activities in support of the PSP will follow the requirements and responsibilities outlined in the procedures and guidance documents referenced below.

1954

- ADM-02, Field Project Prerequisites
- EQT-22, Characterization of Gamma Sensitive Detectors
- EQT-23, Operation of ADCAM Series Analyzers with Gamma Sensitive Detectors
- EQT-32, Troxler 3440 Series Surface Moisture/Density Gauge - Calibration, Operation and Maintenance
- EQT-33, Real Time Differential Global Positioning System Operation
- EQT-39, Operation of the Zeltex® Infrared Moisture Meter.
- Sitewide CERCLA Quality Assurance Project Plan (SCQ)
- SMPL-01, Solids Sampling
- SMPL-21, Collection of Field Quality Control Samples
- Trimble Pathfinder Pro-XL GPS Operation Manual
- User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectrometry at the Fernald Site (User's Manual)

4.3 INDEPENDENT ASSESSMENT

Independent assessment will be performed by the FEMP Quality Assurance (QA) organization by conducting a surveillance, consisting of monitoring/observing on-going project activities and work areas to verify conformance to specified requirements. Surveillances will be planned and documented in accordance with Section 12.3 of the SCQ.

4.4 IMPLEMENTATION OF CHANGES

Before the implementation of changes, the Field Sampling Lead will be informed of the proposed changes. Once the Field Sampling Lead has obtained written or verbal approval (electronic mail is also acceptable) from the Characterization Lead and QA for the changes to the PSP, the changes may be implemented. Changes to the PSP will noted in the applicable field activity logs and on a Variance/Field Change Notice Form (V/FCN). QA must receive the completed V/FCN, which includes the signatures of the Characterization and Sampling Manager, Area Project Manager, and QA within seven days of implementation of the change.

5.0 HEALTH AND SAFETY

1954

Technicians will conform to precautionary surveys performed by personnel representing the Utility Engineer, Industrial Hygiene, and Radiological Control as applicable. All work performed on this project will be performed in accordance to applicable Environmental Monitoring project procedures, RM-0020 (Radiological Control Requirements Manual), RM-0021 (Safety Performance Requirements Manual), Fluor Daniel Fernald (FDF) work permit, Radiological Work Permit (RWP), penetration permits, and other applicable permits. Concurrence with applicable safety permits is required by each technician in the performance of their assigned duties. A safety briefing will be conducted prior to the initiation of field activities. All emergencies shall be reported immediately to the site communication center at 648-6511 or contact "control" on the radio.

6.0 DISPOSITION OF WASTES

During completion of physical sampling activities, field personnel may generate small amounts of soil, sediment, water, and contact waste. Management of these waste streams will be coordinated with WAO through the Project Waste Identification Document (PWID) process. Sample material, including archived certification samples that are no longer needed, will be spread at the point of origin, i.e., sampling locations. Generation of decontamination waters will be minimized in the field, and whenever possible, equipment will be decontaminated at a facility that discharges to the Advanced Wastewater Treatment (AWWT) facility, either directly or indirectly, through the stormwater collection system. Contact waste generation will be minimized by limiting contact with sample media, and by only using disposable materials which are necessary. This waste stream will be evaluated against dumpster criteria during the PWID process. If it does not meet these criteria, an alternative disposition will be identified. PWID #496 has been revised to support these sampling activities.

7.0 DATA MANAGEMENT

1954

A data management process will be implemented so information collected during the investigation will be properly managed following completion of the field activities. As specified in Section 5.1 of the SCQ, daily activities will be recorded on the FAL, with sufficient detail to be able to reconstruct a particular situation without reliance on memory. Sample Collection Logs will be completed according to procedure ADM-02, Field Prerequisites.

Electronically recorded data from the GPS and HPGe systems will be downloaded to disks on a daily basis or as the project requires. Team members will review the data for completeness and accuracy and then download it onto the Local Area Network (LAN). Once on the LAN, the Data Management Contact will perform an evaluation of the data. Once complete, the data will be sent to the loader where it will be loaded onto the Oracle system and an error log will be generated. The data will then be made available to users through both the Graphical Information System (GIS) and Microsoft (MS) Access Software. Field Team Members will retain all downloaded data on disk for future reference and archive.

Field documentation, such as the FAL, Gamma Spectrometry Field Worksheet, Survey Instrument Files, Nuclear Field Density/Moisture Worksheet, and the Sample Collection Log, Sample Request/Sample Analysis Chain of Custody Log will undergo an internal QA/QC review by the field team members. Copies will then be generated and delivered to the Data Management Contact who will perform an evaluation of the data and create the appropriate links between the electronically-recorded data and the paper-generated data. The paper-generated data will be sent to data entry personnel for input into the Oracle System. Field logs may be completed in the field and maintained in loose-leaf form. Field packages will be validated by the QA validation team.

Analytical data from on-site and off-site laboratories will be reported in preliminary form to the Area Project Manager's designee, the Characterization Lead, on at least a weekly basis. This will be done by the laboratory contact as soon as the data are available in the FACTS database. Following required validation of the data for each sample release, the data from that release will be reported to the

Characterization Lead in the final data report format. Qualified data will be entered into the SED. After entry into the SED, certification data can be pulled for statistical analysis and a certification decision.

APPENDIX A

DATA QUALITY OBJECTIVES
(DQOs SL-043, Rev. 1 and SL-048, Rev. 4)

Control Number _____

Fernald Environmental Management Project 1954

Data Quality Objectives

Title: Sitewide Certification Sampling and Analysis

Number: SL-043

Revision: 1

Final Draft: March 23, 1998

Contact Name: Eric Kroger

Approval: William D. Kelley Date: 3-23-98
William D. Kelley
DQO Coordinator

Approval: _____ Date: 3/23/98
J.D. Chiou
SCEP Project Director

Rev. #	0	1					
Effective Date:	7/14/97	3/23/98					

24

DATA QUALITY OBJECTIVES
Sitewide Certification Sampling and Analysis

Members of Data Quality Objectives (DQO) Scoping Team
The members of the scoping team included individuals with expertise in QA, analytical methods, field sampling, statistics, laboratory analytical methods and data management.

Conceptual Model of the Site
Soil sampling was conducted at the Fernald Environmental Management Project (FEMP) during the Operable Unit 5 (OU5) Remedial Investigation/Feasibility Study (RI/FS). Final Remediation Levels (FRLs) for constituents of concern (COCs), along with the extent of soil contaminated above the FRLs, were identified in the OU5 Record of Decision (ROD). Actual soil remediation activities now fall under the guidance of the draft Sitewide Excavation Plan (SEP).

As outlined in the SEP, the FEMP has been divided into individual Remediation Areas (or phased areas within a Remediation Area) to sequentially carry out soil remedial activities. Under the strategy identified in the SEP, pre-design investigations are first conducted to better define the limits of soil excavation requirements. Following any necessary excavation, pre-certification real-time scanning activities are conducted to evaluate residual patterns of soil contamination. Pre-certification scan data should provide a level of assurance that the FRLs will be achieved. When pre-certification data indicate that remediation goals are likely to be met, they are used to define certification units (CUs) within the Remediation Area of interest. Table 2-9 of the draft SEP identifies a list of area-specific COCs (ASCOCs) for each Remediation Area at the FEMP. Based on existing data and production knowledge, a subset of these ASCOCs are conservatively identified within each CU as potentially present in the CU. This suite of CU-specific COCs is the subset of the ASCOCs to be evaluated against the FRLs within that CU. At a minimum, the five primary radiological COCs (total uranium, radium-226, radium-228, thorium-228, thorium-232) will be retained as CU-specific COCs for certification of each CU.

Delineation and justification for the final CU boundaries, along with each corresponding suite of CU-specific ASCOCs is documented in a Certification Design Letter. Upon approval of the Certification Design Letter by the EPA, certification activities can begin. Section 3.4 of the draft SEP presents the general certification strategy.

1.0 Statement of Problem

FEMP soil and potentially impacted adjacent off-property soil must be certified on a CU by CU basis for compliance with the FRLs of all CU-specific ASCOCs. The appropriate sampling, analytical and information management criteria must be

developed to provide the required qualified data necessary to demonstrate attainment of certification statistical criteria. For every area undergoing certification, a sampling plan must be in place that will direct soil samples to be collected which are representative of the CU-specific COC concentrations within the framework of the certification approach identified in the draft SEP. The appropriate analytical methodologies must be selected to provide the required data.

Exposure to Soil

The cleanup standards, or FRLs, were developed for a final site land use as an undeveloped park. Under this exposure scenario, receptors could be directly exposed to contaminated soil through dermal contact, external radiation, incidental ingestion, and/or inhalation of fugitive dust while visiting the park. Exposure to contaminated soil by the modeled receptor is expected to occur at random locations within the boundaries of the FEMP and would not be limited to any single area. Some soil FRLs were developed based on the modeled cross-media impact potential of soil contamination to the underlying aquifer. In these instances, potential exposure to contaminants would be indirect through the groundwater pathway, and not directly linked to soil exposure. Off-site soil FRLs were established at more conservative levels than the on-property soil FRLs, based on an agricultural receptor. Benchmark Toxicity Values (BTVs) are also being considered in the cleanup process by assessing habitat impact of individual BTVs under post-remedial conditions.

Available Resources

Time: Certification sampling will be accomplished by the field sampling team prior to interim or final regrading or release of soil for construction activities. The certification sampling schedule must allow sufficient time, in the event additional remediation is required, to demonstrate certification of FRLs prior to permanent construction or regrading. Certification sampling will have to be completed and analytical results validated and statistical analysis completed prior to submission of a Certification Report to the regulatory agencies.

Project Constraints: Certification sampling and analytical testing must be performed with existing manpower, materials and equipment to support the certification effort. Remediation areas are prioritized for certification sampling and analysis according to the date required for initiation of sequential construction activities in those areas. Fluor Daniel Fernald (FDF) and DOE must demonstrate post-remedial compliance with the CU-specific COC FRLs to release the designated Remediation Area for planned interim grading, eventual restoration under the Natural Resources Restoration Plan (NRRP), and other final land use activities.

[SCQ]. Details on the precision and accuracy of the HPGe instrument are provided in the Comparability of In-Situ Gamma Spectrometry and Laboratory Data and its addendum.

Contaminant-Specific Action Levels
The cleanup levels are the soil FRLs published in the OU5 and OU2 RODs. BTVs being considered in the remediation process are published in the OU5 Ecological Risk Assessment and are being reviewed for site consideration in the NRRP.

Methods of Sampling and Analysis
Physical soil samples and HPGe data will be collected in accordance with the applicable site sampling procedures. Per the SEP, laboratory analysis will be conducted at ASL D using QA/QC protocols specified in the SCQ. Full raw data deliverables will be required from the laboratory to allow for appropriate data validation. For FEMP-approved on- and off-site laboratories, the analytical method used will meet the required precision, accuracy and detection capabilities necessary to achieve FRL analyte ranges.

4.0 The Boundaries of the Situation

Spatial Boundaries
Domain of the Decision: The boundaries of this certification DQO extend to all surface soil in areas that are undergoing certification as part of FEMP remediation.

Population of Soil: Soil includes all excavated surfaces, defined sub-surface intervals, and undisturbed, relatively unimpacted native soil in areas undergoing certification sampling and analysis.

Scale of Decision Making
Based on considerations of the final certification units and the COC evaluation process, the CU-specific COCs are determined. The area undergoing certification will be evaluated on a CU basis, based on physical sample results, as to whether it has passed or failed the criteria for attainment of certification (draft SEP Section 3.4.4).

Temporal Boundaries
Time frame: Certification sampling must be performed in time to sequentially release certified areas for scheduled interim grading, restoration, and other final land use activities. Certification sampling data received from the laboratory will be validated and statistically evaluated. Certification results and findings will be documented in Certification Reports, which must be submitted to and approved by the regulatory agencies prior to release of the areas for scheduled interim grading, restoration, and other final land use activities.

2.0 Identify the Decision

Decision

Demonstrate within each CU if all CU-specific COCs pass the certification criteria. These criteria are as follows: 1) The average concentration of each CU-specific COC is below the FRL and within the agreed upon confidence limits (95% for primary ASCOCs and 90% for secondary ASCOCs); and 2) the hot-spot criteria, that no result for any CU-specific COC is more than two times the associated soil FRL. The certification criteria are discussed in greater detail in Section 3.4.4 of the draft SEP.

Possible Results

1. The average concentration of each CU-specific COC can be demonstrated to be below the FRLs within the confidence level, with no single result for any CU-specific COC greater than three times the associated FRL. The CU can then be certified as attaining remediation goals.

2. The average concentration of at least one CU-specific COC is demonstrated to be above the FRL at the given confidence level. The CU will fail certification and require additional remedial action, per Section 3.4.5 of the draft SEP.

3. If a result(s) of one or more CU-specific COC is demonstrated to be at or above two times the FRL, the CU will fail certification. The CU will fail certification and require additional remedial action per Section 3.4.5 of the draft SEP. A combination of results 2 and 3 also constitutes certification failure.

3.0 Inputs That Affect the Decision

Required Information

Certification data will be obtained through physical soil sampling. Based on the certification analytical results, the average concentrations of each CU-specific COC with specified confidence levels will be calculated using the statistical methods identified in Appendix G of the draft SEP.

Real-time scanning using the High Purity Germanium (HPGe) detector will also be conducted during certification. These results will be used only for comparability purposes with the certification analytical data until the EPA approves this instrument for soil certification (see Section 7.0 of this DQO).

Source of Information

Per the SEP, analysis of certification samples for each CU-specific COC will be conducted at analytical support level (ASL) D in accordance with methods and QA/QC standards in the FEMP Sitewide CERCLA Quality Assurance Project Plan

Practical Considerations: Some areas undergoing remediation will not be accessible for certification sampling until decontamination/demolition and excavation activities are complete. Other areas, such as wood lots, that are relatively uncontaminated and not planned for excavation, may require preparation, such as cutting of grass or removal of undergrowth prior to certification sampling, thus requiring coordination with FEMP Maintenance personnel.

5.0 Decision Rule

Successful certification of soil within the boundaries of a certification unit (CU) demonstrates that the certified soil (surface or subsurface) has concentrations of CU-specific COC(s) that meet the established criteria for attainment of Certification.

Parameters of Interest
The parameters of interest are the individual and average surface soil concentrations of CU-specific COCs and confidence limits on the calculated average within a CU. OU2 and OU5 ROD identify all applicable soil FRLs. The SEP identifies the ASCOCs, a subset of which will be used to establish CU-specific COCs within each Remediation Area undergoing certification sampling and analysis.

Action Levels
The applicable action levels are the on- and off-property soil FRLs published in the OU5 or OU2 ROD for each ASCOC.

Decision Rules
If the average concentration for each CU-specific COC is demonstrated to be below the FRLs within the agreed upon confidence level (95% for primary COCs; 90% for secondary COCs), and no analytical result exceeds two times the soil FRL, then the CU can be certified as complying with the cleanup criteria. If a CU does not meet the FRLs within the agreed upon confidence level for one or more CU-specific COCs, or one or more analytical results for one or more CU-specific COCs is greater than two times the associated soil FRL, then the CU fails certification and requires further assessment as per the SEP.

6.0 Limits on Decision Errors

Types of Decision Errors and Consequences

Definition
Decision Error 1: This decision error occurs when the decision maker decides that a CU has met the certification criteria, when in reality, the certification criteria have not been met. This situation could result in an increased risk to human health and the environment. In addition, this type of error could result in regulatory fees and penalties.

Decision Error 2: This decision error occurs when the decision maker decides a CU does not met the certification criteria, when actually, the certification criteria have been met. This error would result in unnecessary added costs due to the excavation of soil containing COC concentrations below their FRLs, and an increased volume of soil assigned to the OSDF. In addition, unnecessary delays in the remediation schedule may result.

True State of Nature for the Decision Errors

The true state of nature for Decision Error 1 is that the certification criteria are not met (average CU-specific COC concentrations not below the FRL within the specified confidence limits; or a single sample result above two times the FRL). The true state of nature for Decision Error 2 is that certification criteria are met (average CU-specific COC concentrations are below the FRL within the specified confidence limits, and no result is above two times the FRL). Decision Error 1 is the more severe error due to the potential threat this poses to human health and the environment.

Null Hypothesis

H_o: The average concentration of at least one CU-specific COC within a CU is equal to or greater than the associated FRL.

H_1: The average concentration of all CU-specific COCs within a CU is less than the action levels.

False Positive and False Negative Errors

A false positive is Decision Error 1: less than or equal to five percent ($p = .05$) is considered the acceptable decision error in determination of compliance with FRLs for primary ASCOCs, while ten percent ($p = .10$) is acceptable for secondary ASCOCs.

A false negative is Decision Error 2: less than or equal to 20 percent is considered the acceptable decision error. This decision error is controlled through the determination of sample sizes (see Section G.1.4.1 of the draft SEP).

7.0 Design for Obtaining Quality Data

Section 3.4.2 of the draft SEP presents the specifics of the certification sampling design. The following text describes the general certification sampling design.

Soil Sample Locations

In order to select certification sampling locations, each CU is divided into 16 approximately equal cells (or sub-CUs). Certification sample locations are then generated by randomly selecting an easting and northing coordinate within the

boundaries of each cell. Additional alternative sample locations are also generated in case the original random sample location fails the minimum distance criteria. The minimum distance criteria is defined as the minimum distance allowed between random sample locations in order to eliminate the chance of random sample points clustering within a small area. This clustering would tend to over emphasize a small area and, conversely, under represent a large area in certification determination. By not allowing sample locations to be too closely arranged, the sample locations are spread out and provide a more uniform coverage, thus reducing the possibility of large unsampled areas.

The equation used to establish the minimum distance between random location pairs is as follows:

$$\text{distance} = \sqrt{\left(\text{easting}_1 - \text{easting}_0\right)^2 + \left(\text{northing}_1 - \text{northing}_0\right)^2}$$

The equation used to check the minimum distance criteria is

$$\text{MD} = \frac{\sqrt{\text{Area}_{sub-CU}}}{\sqrt{16}} \times \frac{1}{2} \text{ or } \frac{\sqrt{\text{Area}_{sub-CU}}}{8}$$

This equation was derived under the following assumptions:

- $\sqrt{\text{Area}_{sub-CU}}$ = the average length of a CU side

since the area of a CU (in its simplest form, a square) is equal to height time width;

- $\sqrt{16}$ = the average number of *sub-CUs* on a side of the CU

since the number of cells or sub-CUs (in its simplest form, a 4x4 configuration) is equal to 4; and ½ was chosen to allow sample points to be only as close as ½ of the average sub-CU side length.

In the event that the original random sample location failed the minimum distance criteria, the first alternate location was selected and all the locations were retested versus the minimum distance criteria. This process continued until all 16 random locations passed the minimum distance criteria.

HPGe Measurements

As identified in Section 3.4.2.2 of the draft SEP, all 16 sample locations within each CU will first be scanned using the HPGe detector at a height of one foot above ground surface and a count time of 15 minutes. The purpose of these readings is to determine concentrations of the primary radiological COCs. Again, these readings will be used only for comparability purposes until the time that the EPA approves

the HPGe for certification decision making.

Physical Samples
Physical soil certification samples will be collected according to SMPL-01 at all 16 locations per CU, as identified in the Area certification PSP. Sample collection depth will be 0"-6", unless otherwise noted in the PSP. As defined in the PSP, 12 to 16 samples per CU will be submitted to the on-site laboratory or a FDF approved off-site laboratory for analysis at ASL D requirements per the SCQ.

Validation
All field data will be validated, with an ASL D package provided for each analytical report. Also, a minimum of 10 percent of the analytical data from each laboratory will be subject to analytical validation to ASL D requirements in the SCQ. If any result is rejected, all data from the laboratory with the rejected result will then be validated to determine the integrity of the results from that laboratory. This change will be documented in a variance to this PSP.

8.0 Use of Data to Test Null Hypothesis

Appendix G of the draft SEP discusses in detail, the statistical evaluations of certification data used to determine attainment of certification criteria.

Data Quality Objectives
Sitewide Certification Sampling and Analysis

1A. Task/Description: Certification Sampling and Analysis

1.B. Project Phase: (Put an X in the appropriate selection.)

RI ☐ FS ☐ RD ☐ RA ☒ R_vA ☐ OTHER_____

1.C. DQO No.: SL-043, Rev. 1 DQO Reference No.:_____

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2. Media Characterization: (Put an X in the appropriate selection.)

Air ☐ Biological ☐ Groundwater ☐ Sediment ☐ Soil ☒

Waste ☐ Wastewater ☐ Surface water ☐ Other (specify) _____

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3. Data Use with Analytical Support Level (A-E): (Put an X in the appropriate Analytical Support Level selection(s) beside each applicable Data Use.)

Site Characterization
A ☐ B ☐ C ☐ D ☐ E ☐

Risk Assessment
A ☐ B ☐ C ☐ D ☐ E ☐

Evaluation of Alternatives
A ☐ B ☐ C ☐ D ☐ E ☐

Engineering Design
A ☐ B ☐ C ☐ D ☐ E ☐

Monitoring during remediation activities
A ☐ B ☐ C ☐ D ☐ E ☐

Other (Certification)
A ☐ B ☐ C ☐ D ☒* E ☐

4.A. Drivers: Remediation Area Remedial Action Work Plans, Applicable or Relevant and Appropriate Requirements (ARARs) and Operable Unit 2 and Operable Unit 5 Records of Decision (ROD), Sitewide Excavation Plan (SEP).

4.B. Objective: Confirmation that remediation areas at the FEMP, or adjacent off-property areas, have met certification criteria on a CU by CU basis.

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5. Site Information (Description):

The OU2 and OU5 RODs have identified areas at the FEMP that require soil

1954

remediation activities. The RODs specify that the soil in these areas will be demonstrated to be below the FRLs. Certification is necessary for all FEMP soil and some adjacent off-property soil to demonstrate that the residual soil does not contain COC contamination exceeding the FRL at a specified confidence level.

6.A. Data Types with appropriate Analytical Support Level Equipment Selection and SCQ Reference: (Place an "X" to the right of the appropriate box or boxes selecting the type of analysis or analyses required. Then select the type of equipment to perform the analysis if appropriate. Please include a reference to the SCQ Section.)

1. pH	☐	2. Uranium	☒	3. BTX	☐
Temperature	☐	Full Radiological	☒*	TPH	☐
Spec. Conductance	☐	Metals	☒*	Oil/Grease	☐
Dissolved Oxygen	☐	Cyanide	☐		
Technetium-99	☒*	Silica	☐		

4. Cations	☐	5. VOA	☒*	6. Other (specify)
Anions	☐	BNA	☐	
TOC	☐	Pesticides	☒*	
TCLP	☐	PCB	☒*	
CEC	☐			
COD	☐			

*As identified in the Area certification PSP

6.B. Equipment Selection and SCQ Reference:

Equipment Selection		Refer to SCQ Section
ASL A		SCQ Section:
ASL B		SCQ Section:
ASL C		SCQ Section:
ASL D	Per SCQ, and PSP	SCQ Section: Appendix, G , Tbls. 1 & 3
ASL E	HPGe	SCQ Section: H

7.A. Sampling Methods: (Put an X in the appropriate selection.)

Biased [ ] Composite [ ] Environmental [ ] Grab [X] Grid [ ]
Intrusive [X] Non-Intrusive [X]* Random [X]** Phased [ ] Source [ ]
* HPGe measurements
**Systematic random samples, selected one per cell and meeting the minimum distance criterion

7.B. Sample Work Plan Reference: Project Specific Plan for the associated Remediation area Remedial Action Work Plan

Background samples: OU5 RI

7.C. Sample Collection Reference:

Sample Collection Reference: Associated PSP(s), SMPL-01

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8. Quality Control Samples: (Place an "X" in the appropriate selection box.)

8.A. Field Quality Control Samples:

Trip Blanks	[X]*	Container Blanks	[ ]
Field Blanks	[X]**	Duplicate Samples	[X]
Equipment Rinsate Samples	[X]	Split Samples	[X]***
Preservative Blanks	[ ]	Performance Evaluation Samples	[ ]

Other (specify)
*Collected for volatile organic sampling
**As noted in the PSP
*** Split samples will be collected where required by the EPA.

8.B. Laboratory Quality Control Samples:

Method Blank	[X]	Matrix Duplicate/Replicate	[X]
Matrix Spike	[X]	Surrogate Spikes	[X]
Tracer Spike	[X]		

Other (specify) _____

9. Other: Please provide any other germane information that may impact the data quality or gathering of this particular objective, task or data use.

Sample density will be dependent upon the CU size (Group 1 [250'x250'] or Group 2 [500'x500']), as determined by historical and pre-certification scan data.

1954

Control Number _____

Fernald Environmental Management Project

Data Quality Objectives

Title: Delineating the Extent of Constituents of Concern in Pre-design Investigation and Remediation Sampling

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Contact Name: Eric Kroger

Approval: (Signature on File) Date: 7/14/98
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DQO Coordinator

Approval: (Signature on File) Date: 7/14/98
J.D. Chiou
SCEP Project Director

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36

DATA QUALITY OBJECTIVES
Delineating the Extent of Constituents of Concern in Pre-design Investigation and Remediation Sampling

Members of Data Quality Objectives (DQO) Scoping Team

The members of the DQO team include a project lead, a project engineer, a field lead, a statistician, a lead chemist, a sampling supervisor, and a data management lead.

Conceptual Model of the Site

Media is considered contaminated if the concentration of a constituent of concern (COC) exceeds the final remediation levels (FRLs). The extent of specific media contamination was estimated and published in the Operable Unit 5 Feasibility Study (FS). These estimates were based on kriging analysis of available data for media collected during the Remedial Investigation (RI) effort and other FEMP environmental characterization studies. Maps outlining contaminated media boundaries were generated for the Operable Unit 5 FS by overlaying the results of the kriging analysis data with isoconcentration maps of the other constituents of concern (COCs), as presented in the Operable Unit 5 RI report, and further modified by spatial analysis of maps reflecting the most current media characterization data. A sequential remediation plan has been presented that subdivides the FEMP into seven construction areas. During the course of remediation, areas of specific media may require additional characterization so remediation can be carried out as thoroughly and efficiently as possible. As a result, additional sampling may be necessary to accurately delineate a volume of specific media as exceeding a target level, such as the FRL or the Waste Attainment Criterion (WAC). Each individual Project-Specific Plan (PSP) will identify and describe the particular media to be sampled.

1.0 Statement of Problem

If the extent (depth and/or area) of the media COC contamination is unknown, then it must be defined with respect to the appropriate target level (FRL, WAC, or other specified media concentration).

2.0 Identify the Decision

Delineate the horizontal and/or vertical extent of media COC contamination in an area with respect to the appropriate target level.

3.0 Inputs That Affect the Decision

Informational Inputs - Historical data, process history knowledge, the modeled extent of COC contamination, and the origins of contamination will be required to establish a sampling plan to delineate the extent of COC contamination. The

desired precision of the delineation must be weighed against the cost of collecting and analyzing additional samples in order to determine the optimal sampling density. The project-specific plan will identify the optimal sampling density.

Action Levels - COCs must be delineated with respect to a specific action level, such as FRLs and On-Site Disposal Facility (OSDF) WAC concentrations. Specific media FRLs are established in the OU2 and OU5 RODs, and the WAC concentrations are published in the OU5 ROD. Media COCs may also require delineation with respect to other action levels that act as remediation drivers, such as Benchmark Toxicity Values (BTVs).

4.0 The Boundaries of the Situation

Temporal Boundaries - Sampling must be completed within a time frame sufficient to meet the remediation schedule. Time frames must allow for the scheduling of sampling and analytical activities, the collection of samples, analysis of samples and the processing of analytical data when received.

Scale of Decision Making - The decision made based upon the data collected in this investigation will be the extent of COC contamination at or above the appropriate action level. This delineation will result in media contaminant concentration information being incorporated into engineering design, and the attainment of established remediation goals.

Parameters of Interest - The parameters of interest are the COCs that have been determined to require additional delineation before remediation design can be finalized with the optimal degree of accuracy.

5.0 Decision Rule

If existing data provide an unacceptable level of uncertainty in the COC delineation model, then additional sampling will take place to decrease the model uncertainty. When deciding what additional data is needed, the costs of additional sampling and analysis must be weighed against the benefit of reduced uncertainty in the delineation model, which will eventually be used for assigning excavation, or for other purposes.

6.0 Limits on Decision Errors

In order to be useful, data must be collected with sufficient areal and depth coverage, and at sufficient density to ensure an accurate delineation of COC concentrations. Analytical sensitivity and reproducibility must be sufficient to differentiate the COC concentrations below their respective target levels.

Types of Decision Errors and Consequences

Decision Error 1 - This decision error occurs when the decision maker determines that the extent of media contaminated with COCs above action levels is not as extensive as it actually is. This error can result in a remediation design that fails to incorporate media contaminated with COC(s) above the action level(s). This could result in the re-mobilization of excavation equipment and delays in the remediation schedule. Also, this could result in media contaminated above action levels remaining after remediation is considered complete, posing a potential threat to human health and the environment.

Decision Error 2 - This decision error occurs when the decision maker determines that the extent of media contaminated above COC action levels is more extensive than it actually is. This error could result in more excavation than necessary, and this excess volume of materials being transferred to the OSDF, or an off-site disposal facility if contamination levels exceed the OSDF WAC.

True State of Nature for the Decision Errors - The true state of nature for Decision Error 1 is that the maximum extent of contamination above the FRL is more extensive than was determined. The true state of nature for Decision Error 2 is that the maximum extent of contamination above the FRL is not as extensive as was determined. Decision Error 1 is the more severe error.

7.0 Optimizing Design for Useable Data

7.1 Sample Collection

A sampling and analytical testing program will delineate the extent of COC contamination in a given area with respect to the action level of interest. Existing data, process knowledge, modeled concentration data, and the origins of contamination will be considered when determining the lateral and vertical extent of sample collection. The cost of collecting and analyzing additional samples, will be weighed against the benefit of reduced uncertainty in the delineation model. This will determine the sampling density. Individual PSPs will identify the locations and depths to be sampled, the sampling density necessary to obtain the desired accuracy of the delineation, and if samples will be analyzed by the on-site or off-site laboratory. The PSP will also identify the sampling increments to be selectively analyzed for concentrations of the COC(s) of interest, along with field work requirements. Analytical requirements will be listed in the PSP. The chosen analytical methodologies are able to achieve a detection limit capable of resolving the COC action level. Sampling of groundwater monitoring wells may require different purge requirements than those stated in the SCQ (i.e., dry well definitions or small purge volumes). In order to accommodating sampling of wells that may go dry prior to completing purging of three well volume, attempts to sample the

monitoring wells will be made 24 hours after purging the well dry. If, after the 24 hour period, the well does not yield the required volume, the analytes will be collected in the order stated in the applicable PSP until the well goes dry. Any remaining analytes will not be collected. In some instances, after the 24 hour wait the well may not yield any water. For these cases, the well will be considered dry and will not be sampled.

7.2 COC Delineation

The media COC delineation will use all data collected under the PSP, and if deemed appropriate by the Project Lead, may also include existing data obtained from physical samples, and if applicable, information obtained through real-time screening. The delineation may be accomplished through modeling (e.g. kriging) of the COC concentration data with a confidence limit specific to project needs that will reduce the potential for Decision Error 1. A very conservative approach to delineation may also be utilized where the boundaries of the contaminated media are extended to the first known vertical and horizontal sample locations that reveal concentrations below the desired action level.

7.3 QC Considerations

Laboratory work will follow the requirements specified in the SCQ. If analysis is to be carried out by an off-site laboratory, it will be a Fluor Daniel Fernald approved full service laboratory. Laboratory quality control measures include a media prep blank, a laboratory control sample (LCS), matrix duplicates and matrix spike. Typical Field QC samples are not required for ASL B analysis. However the PSPs may specify appropriate field QC samples for the media type with respect to the ASL in accordance with the SCQ, such as field blanks, trip blanks, and container blanks. All field QC samples will be analyzed at the associated field sample ASL. If collected, the frequency of field QC sampling is as follows:

Duplicate samples will be taken at a minimum of one per 20 samples. Rinsates will be performed at a minimum of one per 20 samples or one per 20 field sampling tools that are re-used. Trip blanks will be taken at a minimum of one per shipping container when analyzing for volatile organic compounds (VOCs). For VOCs, container blanks will be taken at a minimum of one per Area and Phase per container type (i.e. stainless steel core liner/plastic core liner/Geoprobe tube) when using uncertified containers. Field blanks are not necessary for soil metal analysis, as it is unlikely in ambient field conditions to have metals cross contamination. However, the potential of cross contamination with semi-volatile organic compounds (SVOCs) is higher, therefore soil samples being analyzed for SVOCs may also require associated field blanks to be collected and analyzed. If collected, field blanks will be taken at a minimum of one per 20 soil samples.

Per the Sitewide Excavation Plan, the ASL and data validation requirements for soil and field QC samples collected in association with this DQO are as follows:

- If physical samples are analyzed for Pre-design Investigations and/or Pre-certification delineations, 100% of the data will be analyzed per ASL B requirements. 90% of the data will require only a Certificate of Analysis, the other 10% will require the Certificate of Analysis and all associated QA/QC results, and will be validated to ASL B. Per Appendix H of the SEP, the minimum detection level (MDL) for these analyses will be established at approximately 10% of the action level (the action level for precertification is the FRL; the action level for pre-design investigations can be several different action levels, including the FRL, the WAC, RCRA levels, ALARA levels, etc.). If this MDL is different from the SCQ-specified MDL, the ASL will default to ASL E, though other analytical requirements will remain as specified for ASL B.

- If samples are analyzed for WAC Attainment and/or RCRA Characteristic Areas Delineation, 100% of the data will be analyzed and reported to ASL B with 10% validated. The ASL B package will include a Certificate of Analysis along with all associated QA/QC results. Total uranium analyses using a higher detection limit than is required for ASL B (10 mg/kg) may be appropriate for WAC attainment purposes since the WAC limit for total uranium is 1,030 mg/kg. In this case, an ASL E designation will apply to the analysis and reporting to be performed under the following conditions:

    - all of the ASL B laboratory QA/QC methods and reporting criteria will apply with the exception of the total uranium detection limit

    - the detection limit will be ≤10% of the WAC limit (e.g., ≤103 mg/kg for total uranium).

- If delineation data are also to be used for certification, the data must meet the data quality objectives specified in the Certification DQO (SL-043).

All data will undergo an evaluation by the Project Team, including a comparison for consistency with historical data. Deviations from QC considerations resulting from evaluating inputs to the decision from Section 3, must be justified in the PSP such that the objectives of the decision rule in Section 5 are met.

7.4 Independent Assessment

Independent assessment shall be performed by the FEMP QA organization by conducting surveillances. Surveillances will be planned and documented in accordance with Section 12.3 of the SCQ.

7.5 Data Management

Upon receipt from the laboratory, all results will be entered into the SED as qualified data using standard data entry protocol. The required ASL B, D or E data will undergo analytical validation by the FEMP validation team. A minimum of ten percent (10%) of field data will be validated by the FEMP QA validation team. The Project Manager will be responsible to determine data usability as it pertains to supporting the DQO decision of determining delineation of media COC's.

7.6 Applicable Procedures

Sample collection will be described in the PSP with a listing of applicable procedures. Typical related plans and procedures are the following:

- Sitewide Excavation Plan (SEP)
- Sitewide CERCLA Quality Assurance Project Plan (SCQ).
- SMPL-01, *Solids Sampling*
- SMPL-02, *Liquids and Sludge Sampling*
- SMPL-21, *Collection of Field Quality Control Samples*
- EQT-06, *Geoprobe® Model 5400 Operation and Maintenance*
- EQT-23, *Operation of High Purity Germanium Detectors*
- EQT-30, *Operation of Radiation Tracking Vehicle Sodium Iodide Detection System*

Data Quality Objectives
Delineating the Extent of Constituents of Concern in Pre-design Investigations and Remediation Sampling

1A. Task/Description: Delineating the extent of contamination above the FRLs

1.B. Project Phase: (Put an X in the appropriate selection.)

RI ☐ FS ☐ RD ☒ RA ☐ R_vA ☐ OTHER ☐

1.C. DQO No.: SL-048, Rev. 4 DQO Reference No.:_____

---

2. Media Characterization: (Put an X in the appropriate selection.)

Air ☐ Biological ☐ Groundwater ☒ Sediment ☒ Soil ☒

Waste ☒ Wastewater ☐ Surface water ☐ Other (specify) _____

---

3. Data Use with Analytical Support Level (A-E): (Put an X in the appropriate Analytical Support Level selection(s) beside each applicable Data Use.)

Site Characterization
A ☐ B ☒ C ☐ D ☒ E ☒

Risk Assessment
A ☐ B ☐ C ☐ D ☐ E ☐

Evaluation of Alternatives
A ☐ B ☐ C ☐ D ☐ E ☐

Engineering Design
A ☐ B ☒ C ☐ D ☒ E ☒

Monitoring during remediation
A ☐ B ☒ C ☐ D ☒ E ☒

Other
A ☐ B ☐ C ☐ D ☐ E ☐

4.A. Drivers: Remedial Action Work Plans, Applicable or Relevant and Appropriate Requirements (ARARs) and the OU2 and/or OU5 Record of Decision (ROD).

4.B. Objective: Delineate the extent of media contaminated with a COC (or COCs) with respect to the action level(s) of interest.

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5. Site Information (Description):

6.A. Data Types with appropriate Analytical Support Level Equipment Selection and SCQ Reference: (Place an "X" to the right of the appropriate box or boxes selecting the type of analysis or analyses required. Then select the type of equipment to perform the analysis if appropriate. Please include a reference to the SCQ Section.)

1.	pH	X *	2.	Uranium	X *	3.	BTX	☐
	Temperature	X *		Full Radiological	X *		TPH	☐
	Specific Conductance	X *		Metals	X *		Oil/Grease	☐
	Dissolved Oxygen	X *		Cyanide	☐			
	Technetium-99	X *		Silica	☐			

4.	Cations	☐	5.	VOA	X *	6.	Other (specify)
	Anions	☐		BNA	X *		
	TOC	☐		Pesticides	X *		
	TCLP	X *		PCB	X *		
	CEC	☐		COD	☐		

*If constituent is identified for delineation in the individual PSP.

6.B. Equipment Selection and SCQ Reference:

	Equipment Selection	Refer to SCQ Section
ASL A		SCQ Section:
ASL B	X	SCQ Section: App. G Tables G-1&G-3
ASL C		SCQ Section:
ASL D	X	SCQ Section: App. G Tables G-1&G-3
ASL E	X (See sect. 7.3, pg. 6)	SCQ Section: App. G Tables G-1&G-3

7.A. Sampling Methods: (Put an X in the appropriate selection.)

Biased [X] Composite [ ] Environmental [X] Grab [X] Grid [X]

Intrusive [X] Non-Intrusive [ ] Phased [ ] Source [ ]

DQO Number: SL-048, Rev. 4

7.B. Sample Work Plan Reference: This DQO is being written prior to the PSPs.

Background samples: OU5 RI

7.C. Sample Collection Reference:

Sample Collection Reference: SMPL-01, SMPL-02, EQT-06

---

8. Quality Control Samples: (Place an "X" in the appropriate selection box.)

8.A. Field Quality Control Samples:

Trip Blanks	X *	Container Blanks	X ++
Field Blanks	X +	Duplicate Samples	X ***
Equipment Rinsate Samples	X ***	Split Samples	X **
Preservative Blanks	☐	Performance Evaluation Samples	☐
Other (specify)			

* For volatile organics only
** Split samples will be collected where required by EPA or OEPA.
*** If specified in PSP.
\+ Collected at the discretion of the Project Manager (if warranted by field conditions)
\+ + One per Area and Phase Area per container type (i.e. stainless steel core liner/plastic core liner/Geoprobe tube).

8.B. Laboratory Quality Control Samples:

Method Blank	X	Matrix Duplicate/Replicate	X
Matrix Spike	X	Surrogate Spikes	☐
Tracer Spike	☐		

Other (specify) Per SCQ

9. Other: Please provide any other germane information that may impact the data quality or gathering of this particular objective, task or data use.

APPENDIX B

AREA 8, PHASE II AND AREA 6 TRIANGLE AREA
CERTIFICATION SAMPLES AND
AREA 6 TRIANGLE AREA DRAINAGE DITCH
INVESTIGATION SAMPLES

APPENDIX B.

Area 8 Phase II/Area 6 Triangle Area Certification Samples and Triangle Area Drainage Investigation Samples

1954

CERTIFICATION UNIT	SUB-CU	SAMPLE ID	ANALYSIS	EASTING	NORTHING
A8PII-01	1	A8PII-01-C-1R	TAL A	1345157	483202
A8PII-01	1	A8PII-01-C-1R-D	TAL A	1345157	483202
A8PII-01	2	A8PII-01-C-2R	ARCHIVE	1345161	483384
A8PII-01	3	A8PII-01-C-3R	TAL A	1345178	483475
A8PII-01	4	A8PII-01-C-4R	TAL A	1345147	483601
A8PII-01	5	A8PII-01-C-5R	TAL A	1345215	483728
A8PII-01	6	A8PII-01-C-6R	ARCHIVE	1345208	483823
A8PII-01	7	A8PII-01-C-7R	TAL A	1345165	483922
A8PII-01	8	A8PII-01-C-8R	TAL A	1345160	484006
A8PII-01	9	A8PII-01-C-9R	TAL A	1345270	483886
A8PII-01	10	A8PII-01-C-10R	ARCHIVE	1345393	483912
A8PII-01	11	A8PII-01-C-11R	TAL A	1345287	483983
A8PII-01	12	A8PII-01-C-12R	TAL A	1345443	483994
A8PII-01	13	A8PII-01-C-13R	TAL A	1345529	483901
A8PII-01	14	A8PII-01-C-14R	TAL A	1345722	483903
A8PII-01	15	A8PII-01-C-15R	ARCHIVE	1345590	483958
A8PII-01	16	A8PII-01-C-16R	TAL A	1345724	483979
A8PII-02	1	A8PII-02-C-1R	TAL A	1345411	483135
A8PII-02	2	A8PII-02-C-2R	ARCHIVE	1345482	483211
A8PII-02	3	A8PII-02-C-3R	TAL A	1345346	483288
A8PII-02	4	A8PII-02-C-4R	TAL A	1345270	483259
A8PII-02	5	A8PII-02-C-5R	TAL A	1345466	483382
A8PII-02	6	A8PII-02-C-6R	TAL A	1345289	483333
A8PII-02	7	A8PII-02-C-7R	TAL A	1345416	483452
A8PII-02	8	A8PII-02-C-8R	ARCHIVE	1345262	483473
A8PII-02	9	A8PII-02-C-9R	TAL A	1345448	483610
A8PII-02	10	A8PII-02-C-10R	TAL A	1345324	483569
A8PII-02	11	A8PII-02-C-11R	ARCHIVE	1345368	483766
A8PII-02	12	A8PII-02-C-12R	TAL A	1345242	483713
A8PII-02	13	A8PII-02-C-13R	TAL A	1345706	483859
A8PII-02	14	A8PII-02-C-14R	ARCHIVE	1345606	483812
A8PII-02	15	A8PII-02-C-15R	TAL A	1345365	483847
A8PII-02	15	A8PII-02-C-15R-D	TAL A	1345365	483847
A8PII-02	16	A8PII-02-C-16R	TAL A	1345270	483826
A8PII-03	1	A8PII-03-C-1R	TAL A	1345805	482988
A8PII-03	2	A8PII-03-C-2R	TAL A	1345724	482977
A8PII-03	3	A8PII-03-C-3R	ARCHIVE	1345746	483200
A8PII-03	4	A8PII-03-C-4R	TAL A	1345646	483120
A8PII-03	5	A8PII-03-C-5R	ARCHIVE	1345552	483186
A8PII-03	6	A8PII-03-C-6R	TAL A	1345875	483280
A8PII-03	7	A8PII-03-C-7R	TAL A	1345671	483322
A8PII-03	8	A8PII-03-C-8R	TAL A	1345591	483311
A8PII-03	9	A8PII-03-C-9R	TAL A	1345798	483364
A8PII-03	10	A8PII-03-C-10R	TAL A	1345778	483482
A8PII-03	10	A8PII-03-C-10R-D	TAL A	1345778	483482

APPENDIX B.

Area 8 Phase II/Area 6 Triangle Area Certification Samples and Triangle Area Drainage Investigation Samples

1954

CERTIFICATION UNIT	SUB-CU	SAMPLE ID	ANALYSIS	EASTING	NORTHING
A8PII-03	11	A8PII-03-C-11R	ARCHIVE	1345738	483562
A8PII-03	12	A8PII-03-C-12R	TAL A	1345730	483730
A8PII-03	13	A8PII-03-C-13R	TAL A	1345562	483392
A8PII-03	14	A8PII-03-C-14R	ARCHIVE	1345582	483531
A8PII-03	15	A8PII-03-C-15R	TAL A	1345507	483547
A8PII-03	16	A8PII-03-C-16R	TAL A	1345533	483635
A8PII-04	1	A8PII-04-C-1R	ARCHIVE	1345882	482791
A8PII-04	2	A8PII-04-C-2R	TAL A	1345822	482925
A8PII-04	3	A8PII-04-C-3R	TAL A	1345786	482816
A8PII-04	4	A8PII-04-C-4R	TAL A	1345735	482914
A8PII-04	5	A8PII-04-C-5R	TAL A	1345614	482852
A8PII-04	6	A8PII-04-C-6R	TAL A	1345648	482968
A8PII-04	7	A8PII-04-C-7R	ARCHIVE	1345514	482907
A8PII-04	8	A8PII-04-C-8R	TAL A	1345531	482976
A8PII-04	9	A8PII-04-C-9R	TAL A	1345468	482941
A8PII-04	10	A8PII-04-C-10R	TAL A	1345450	483054
A8PII-04	11	A8PII-04-C-11R	ARCHIVE	1345312	482907
A8PII-04	12	A8PII-04-C-12R	TAL A	1345332	483040
A8PII-04	12	A8PII-04-C-12R-D	TAL A	1345332	483040
A8PII-04	13	A8PII-04-C-13R	TAL A	1345268	482984
A8PII-04	14	A8PII-04-C-14R	TAL A	1345279	483087
A8PII-04	15	A8PII-04-C-15R	ARCHIVE	1345190	482931
A8PII-04	16	A8PII-04-C-16R	TAL A	1345139	483092
A6TA-01	1	A6TA-01-C-1R	TAL A	1344106	483229
A6TA-01	2	A6TA-01-C-2R	TAL A	1344170	483133
A6TA-01	3	A6TA-01-C-3R	ARCHIVE	1344245	483077
A6TA-01	4	A6TA-01-C-4R	TAL A	1344259	482956
A6TA-01	5	A6TA-01-C-5R	TAL A	1344342	483035
A6TA-01	6	A6TA-01-C-6R	TAL A	1344328	482940
A6TA-01	6	A6TA-01-C-6R-D	TAL A	1344328	482940
A6TA-01	7	A6TA-01-C-7R	TAL A	1344432	482974
A6TA-01	8	A6TA-01-C-8R	ARCHIVE	1344394	482933
A6TA-01	9	A6TA-01-C-9R	TAL A	1344509	482960
A6TA-01	10	A6TA-01-C-10R	TAL A	1344507	482868
A6TA-01	11	A6TA-01-C-11R	ARCHIVE	1344575	482872
A6TA-01	12	A6TA-01-C-12R	TAL A	1344626	482841
A6TA-01	13	A6TA-01-C-13R	TAL A	1344712	482855
A6TA-01	14	A6TA-01-C-14R	TAL A	1344771	482830
A6TA-01	15	A6TA-01-C-15R	ARCHIVE	1344908	482866
A6TA-01	16	A6TA-01-C-16R	TAL A	1344970	482880
--	--	A6TA-INV-1	TAL A	1344095	483381
--	--	A6TA-INV-2	TAL A	1344847	482995
--	--	A6TA-INV-3	TAL A	1344949	482969
--	--	A6TA-INV-4	TAL A	1345077	482936

48